Development of short-range LIDAR for future Mars landing mission

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The thermal structure of the atmosphere is controled by the distribution of small particles (aerosol particles).
They absorb and scatter a part of the solar radiation and the thermal emission from the surface. The spatial and size distribution of small particles is therefore a key to understand the thermal structure of the atmosphere.
This is also the case for Mars. The red planet is known as having a dusty atmosphere whoes thermal structure drastically changes depending on the distribution of the dust grains. The total amount of the dust grains in martian atmosphere is to be decided by the balance between the supply of dust grains from the surface and the sink of dust grains onto the surface. But the mechanism of the dust supply is unclear yet. Although dust-devils are proposed to be the most plausible mechanism to make the dust grains detached from the surface, the efficiency of the dust detachment is still hard to estimate. This is because the efficiency depends on many factors, such as the shape of a dust grain, the humidity, the electrostatic state of the dust grain and the surface, the size distribution function of dust grains on the surface, and so on.
To unveil the distribution and the motion of dust grains in a dust devil, we are developping a LIDAR. This LIDAR observes the dust grains on the line of sight in the range of around 100m with the spacial and temporal resolution less than 1m and 1s, respectively. The verification test of the LIDAR is conducted at the large wind tunnel at Meteorological Research Institute, Japan Meteorological Agency.

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